

FIG. 1

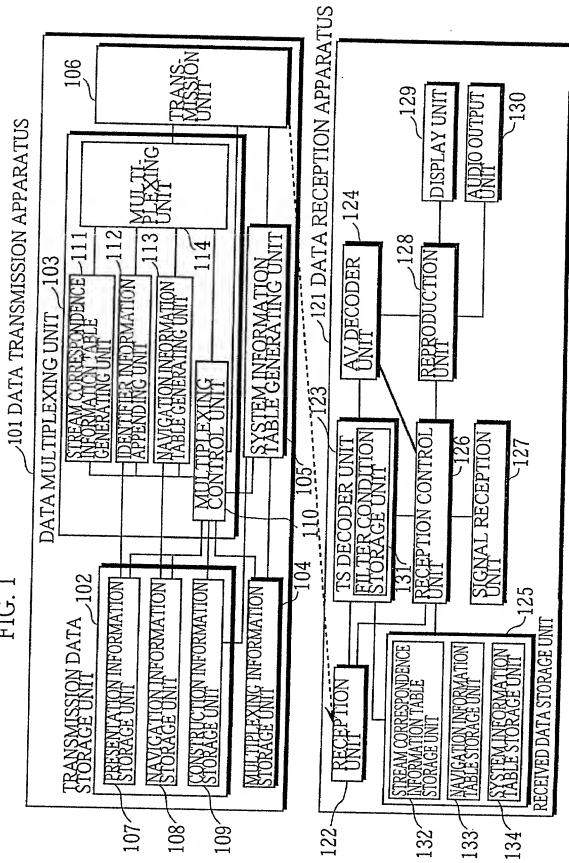


FIG. 2

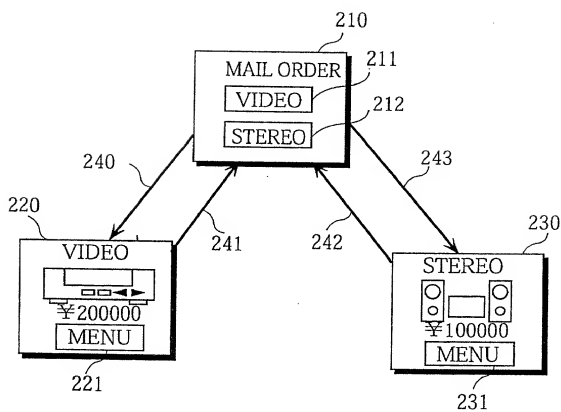


FIG. 3

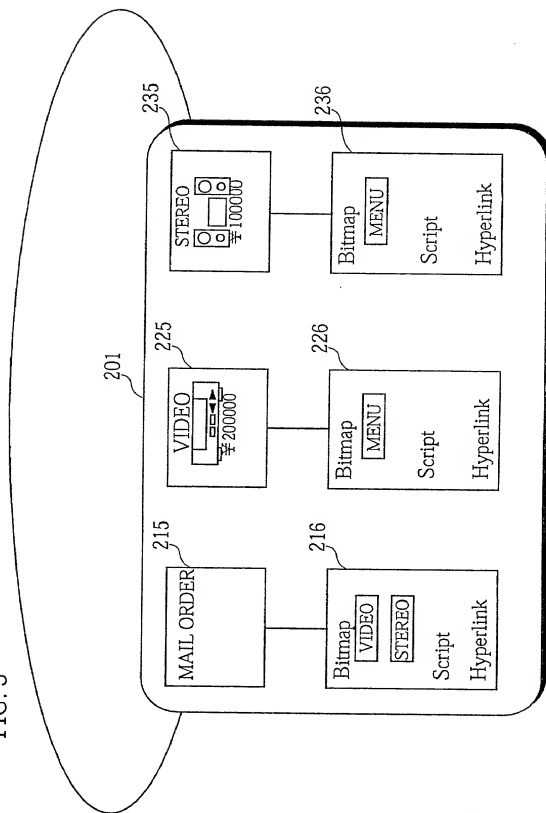


FIG. 4

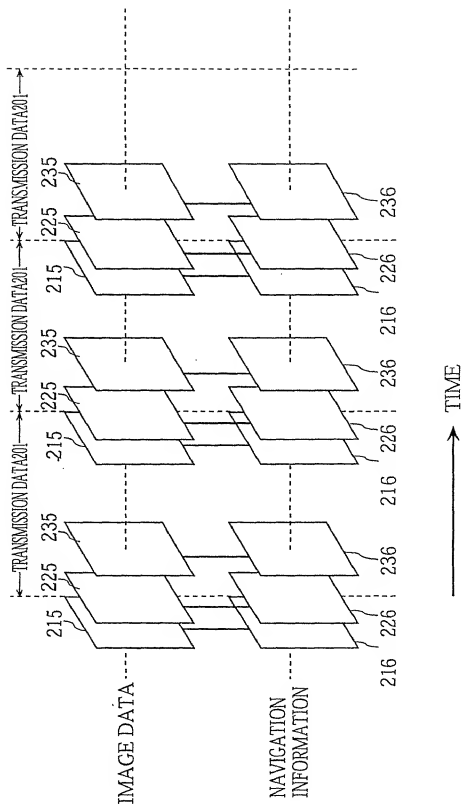


Figure 3 illustrates the structure of a video stream, showing a sequence of frames (I-frames, P-frames, and B-frames) and their temporal positions. The frames are arranged in a grid-like structure, with the first frame (I1) at the top left and the last frame (B10) at the bottom right. The diagram shows the temporal relationships between the frames, including the sequence of I-frames, P-frames, and B-frames, and the temporal positions of each frame.

FIG. 6

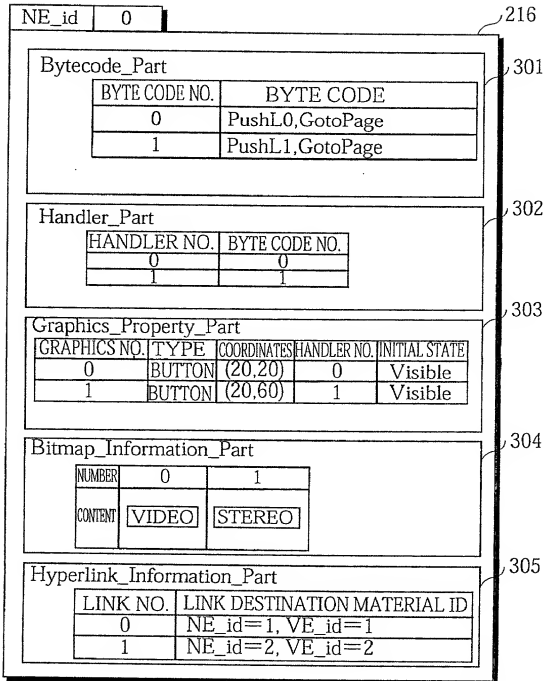
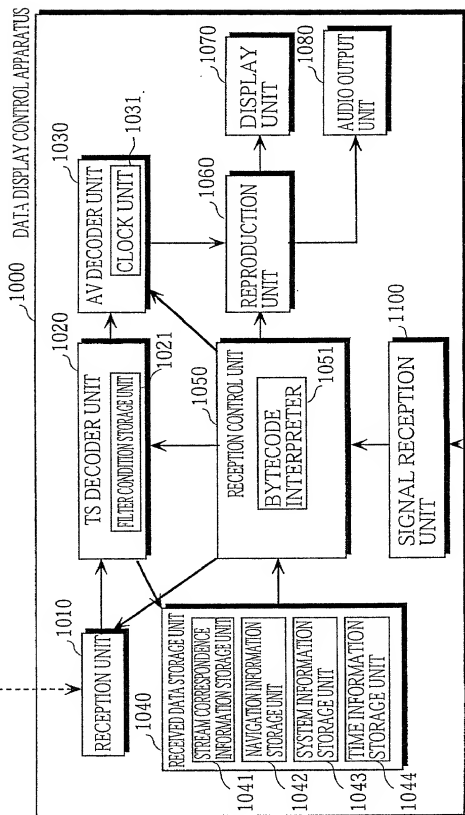


FIG. 7



Bitmap_Information_Part 6165, and a
Hyperlink_Information_Part 6166.

Here, the Bytecode_Part 6162 is the same as the
Bytecode_Part 2162 in the first embodiment, the Handler_Part
5 6163 is the same as the Handler_Part 2163, the
Bitmap_Information_Part 6165 is the same as the
Bitmap_Information_Part 2165, and the
Hyperlink_Information_Part 6166 is the same as the
Hyperlink_Information_Part 2166 (see Fig. 11).

0 The differences with the first embodiment lie in the
lack of a Time_Event_Part in the present embodiment, and in
the construction of the Graphics_Property_Part.

In addition to the graphics numbers, graphics types,
coordinates, handler numbers, and initial states of the
15 Graphics_Property_Part 2164 of the first embodiment, the
Graphics_Property_Part 6164 additionally includes
information for a pairing of a time and display state. Note
here that it is also possible for a plurality of pairings of
a time and display state to be given in this
20 Graphics_Property_Part.

For the example shown in Fig. 24, the
Graphics_Property_Part 6164 includes a time and a display
state for each of graphics numbers 0, 1, and 2, so that the
button with the graphics number 0 and the button with the
25 graphics number 1 are made invisible at 15:00:00 on
September 9, 1996, while the button with the graphics number

2 is made visible at 15:00:00 on September 9, 1996.

Operation Control Construction

5 The following is an explanation of the operation of the reception control unit 1050 based on the example data shown in Fig. 24. Here, operations which are the same as those described in the first embodiment have been omitted.

Fig. 25 is a flowchart showing the content switching process and the process for activation of a handler in the present fourth embodiment. Fig. 26 shows the transformation in the display screen in this fourth embodiment.

10 The reception control unit 1050 first displays the first content given as the information designated by the VE_id and the NE_id given in the PMT in the system information storage unit 1043 (S6510). The following explanation will deal with the case when "VE_id=0" and "NE_id=0" is given in the PMT. The explanation also
15 supposes that the present time is 14:59:00 on September 9, 1996.

20 The reception control unit 1050 obtains the present time and adjusts it using the time difference (S6520, S6530). Here, since the Graphics_Property_Part 6164 states that the graphics for "Video" with the graphics number "0" have an initial state of "visible" but should be invisible
25 after 15:00:00 on September 9, 1996, the reception control unit 1050 judges that these graphics should be visible at

the present time of 14:59:00 on September 9, 1996 (S6540, S6550), and so makes these graphics visible (S6560). Next, the reception control unit 1050 focuses on the graphics "Stereo" with the graphics number "1" (S6580, S6540), judges
5 that these graphics should also be made visible (S6550), and so makes these graphics visible (S6560). Next, the reception control unit 1050 focuses on the graphics "This offer is no longer valid" with the graphics number "2" (S6580, S6540), but since these graphics should only be made
visible after 15:00:00 on September 9, 1996, judges that these graphics should be invisible at the present time of 14:59:00 on September 9, 1996 (S6550), and so makes these graphics invisible (S6570). This display state is shown as 6810 in Fig. 26.

On completing the graphics display processing, the reception control unit 1050 moves the selection pointer in accordance with the user inputs (S6590), and, when there has been a button selection and activation operation by the user (S6600), activates the handler corresponding to the selected
20 button (S6610).

Hereafter, time passes and the present time becomes 15:00:00 on September 9, 1996.

The reception control unit 1050 obtains the present time and adjusts it using the time difference (S6520, S6530). Here, since the Graphics_Property_Part 6164 states
25 that the graphics for "Video" with the graphics number "0"

have an initial state of "visible" but should be invisible after 15:00:00 on September 9, 1996, the reception control unit 1050 judges that these graphics should be made invisible at the present time of 15:00:00 on September 9, 1996 (S6540, S6550), and so makes these graphics invisible (S6570). Next, the reception control unit 1050 focuses on the graphics "Stereo" with the graphics number "1" (S6580, S6540), judges that these graphics should also be made invisible (S6550), and so makes these graphics invisible (S6570). After this, the reception control unit 1050 focuses on the graphics "This offer is no longer valid" with the graphics number "2" (S6580, S6540). Since the Graphics_Property_Part 6164 states that these graphics have an initial state of "invisible" but should be visible after 15:00:00 on September 9, 1996, the reception control unit 1050 judges that these graphics should be made visible at the present time of 15:00:00 on September 9, 1996 (S6550), and so makes these graphics visible (S6560).

As a result of the operation described above, the display screen becomes as shown as 6820 in Fig. 26.

With the data display control apparatus of the present embodiment, control can be performed to display or not display graphics at a time which is indicated separately for each set of graphics.

Fifth Embodiment

The following is an explanation of the data display control apparatus of the fifth embodiment of the present invention. This data display control apparatus receives a digital broadcast and is characterized by including a construction for adjusting the starting times of programs and starting programs once a specified time has been reached.

The data transmission apparatus of this fifth embodiment differs from the first embodiment in only the content of the transmitted navigation information, so that the construction of the data display control apparatus has been omitted. Instead, the data display control apparatus of this fifth embodiment will be described in terms of the content of the navigation information.

Construction

The construction of the data display control apparatus of the fifth embodiment is the same as that of the first embodiment (see Fig. 7), so that the data display control apparatus 1000 is composed of a reception unit 1010, a TS decoder unit 1020, an AV decoder unit 1030, a received data storage unit 1040, a reception control unit 1050, a reproduction unit 1060, a display unit 1070, an audio output unit 1080, and a signal reception unit 1100. The operation of the reception control unit 1050, however, is different in this fifth embodiment, so that this will be described in

more detail below.

Data Construction

Of the data handled by the data display control
5 apparatus of the fifth embodiment, only the navigation
information differs from the data described in the first
embodiment, with the other kinds of data being the same as
before.

The data construction of the navigation information
10 7160 is shown in Fig. 27. This navigation information 7160
corresponds to the navigation information 2160 described in
the first embodiment, and includes a Time_Event_Part 7161, a
Bytecode_Part 7162, a Handler_Part 7163, a
Graphics_Property_Part 7164, a Bitmap_Information_Part 7165,
15 and a Hyperlink_Information_Part 7166.

Here, the Time_Event_Part 7161 is the same as the
Time_Event_Part 2161 in the first embodiment, the
Bytecode_Part 7162 is the same as the Bytecode_Part 2162,
the Handler_Part 7163 is the same as the Handler_Part 2163,
20 the Graphics_Property_Part 7164 is the same as the
Graphics_Property_Part 2164, the Bitmap_Information_Part
7165 is the same as the Bitmap_Information_Part 2165, and
the Hyperlink_Information_Part 7166 is the same as the
Hyperlink_Information_Part 2166 (see Fig. 11).

25 The difference with the data construction of the first
embodiment lies in the inclusion of an NE start time in

addition to the NE_id in each navigation element.

For the example in Fig. 27, the NE start time shows that execution can only be performed from 14:00:00 on September 9, 1996 onwards, so that even if there is a user operation which selects the content corresponding to the navigation element with the NE_id "0" before 14:00:00 on September 9, 1996, the data display control apparatus will wait until the present time reaches 14:00:00 on September 9, 1996 before referring to the navigation element with this NE_id "0" and performing the control of the display.

Operation Control Construction

The following is an explanation of the operation of the reception control unit 1050 based on the example data shown in Fig. 27. Here, operations which are the same as those described in the first embodiment have been omitted.

Fig. 28 is a flowchart showing the content switching process and the process for activation of a handler in the present fifth embodiment.

This explanation supposes that the present time is 13:59:00 on September 9, 1996, and that the user has made a selection and activation operation for a button which switches from a given content to a content identified by NE_id=0 and VE_id=0.

The reception control unit 1050 judges that there has been a content switching (S7510), obtains the present time,

and adjusts the present time using the time difference (S7520, S7530).

After this, the reception control unit 1050 refers to the navigation element with the NE_id=0, finds that the NE
5 start time is given as 14:00:00 on September 9, 1996, obtains the present time once again, and performs adjustment for the time difference (S7540, S7520, and S7530).

Here, time passes and the processing in steps S7540, 7520, and S7530 are repeated until the present time is
10 judged to have reached 14:00:00 on September 9, 1996 (S7540), at which point the content is displayed (S7550).

The following processes (S7560-S7650) are the same as S3040-S3130 in the first embodiment, and so will not be described.

By operating in this way, the reception control unit
15 1050 can display contents only after an indicated time has been reached, so that a digital broadcasting system can perform control in accordance with the progression of programs while maintaining their interactive aspects.

Sixth Embodiment

The following is an explanation of the data display control apparatus of the sixth embodiment of the present invention. This data display control apparatus receives a
25 digital broadcast and is characterized by including a construction for performing control to execute a specified

operation once a predetermined time period has elapsed from the start of display of a content.

The data transmission apparatus of this sixth embodiment differs from the first embodiment in only the content of the transmitted navigation information, so that the construction of the data display control apparatus has been omitted. Instead, the data display control apparatus of this sixth embodiment will be described in terms of the content of the navigation information.

Construction

The construction of the data display control apparatus of the sixth embodiment is the same as that of the first embodiment (see Fig. 7), so that the data display control apparatus 1000 is composed of a reception unit 1010, a TS decoder unit 1020, an AV decoder unit 1030, a received data storage unit 1040, a reception control unit 1050, a reproduction unit 1060, a display unit 1070, an audio output unit 1080, and a signal reception unit 1100.

The time information storage unit 1044 in the received data storage unit 1040 differs to the first embodiment in that the present time is stored by a counting unit (not illustrated) provided in the data display control apparatus. The present time calculated by this counting unit is expressed as hours, minutes, seconds, and frames, such as 11 hours, twenty minutes, 30 seconds and 15 frames, where one

frame is one thirtieth of one second. Here, however, one frame may be set as one twenty-fifth of one second, so that the term "frame" simply represents a predetermined unit of time.

5 The operation of the reception control unit 1050 differs to that in the first embodiment, with this being described in more detail below.

Display Screens and Data Composing Contents

10 The following is an explanation of the display of contents by the data display control apparatus 1000 and of the data composing contents, with reference to Figs. 29, 30, and 31.

15 Fig. 29 shows example display screens for the data display control apparatus 1000 of the sixth embodiment of the present invention. These display screens relate to a quiz program, and include a content 8100 displaying a question, a content 8200 displaying indicating that a correct answer has been given, a content 8300 displaying indicating that an incorrect answer has been given, and a
20 content 8400 displaying that time is up.

 In this example, when the content 8100 for the question "Which is a red fruit ?" is displayed on the display screen and the user selects and confirms the "Apple"
25 button 8110, the display screen switches, as shown by the arrow 8010, to a display of the content 8200 showing that

the correct answer has been given. In the same way, when the user selects and confirms the "Tangerine" button 8120, the display screen switches, as shown by the arrow 8020, to a display of the content 8300 showing that an incorrect answer has been given.

When ten seconds have passed from the start of the display of content 8100, the display switches to content 8400 showing that time is up.

Data Transmission Apparatus

To allow the data display control apparatus of the sixth embodiment of the present invention to perform the switching of display in response to interactive operations, data composing the contents is transmitted as described below.

It should be noted that the data transmission apparatus of the sixth embodiment has the same construction as the data transmission apparatus 101 described in the related art section. As described below, however, unlike the navigation information of the related art, the navigation information of the present embodiment includes information to allow control with a time element.

Fig. 30 gives a simplified representation of the data transmitted by the data transmission apparatus. Fig. 30 shows the data that composes the contents shown in Fig. 29, with the data 8000 being transmitted with a predetermined

period by the data transmission apparatus. This transmitted data 8000 is composed of the sets of image data 8150, 8250, 8350, and 8450, and the sets of navigation information 8160, 8260, 8360, and 8460.

5 These sets of image data 8150, 8250, 8350, and 8450 are the background images for the contents 8100, 8200, 8300, and 8400 which are displayed on the display screen of the data display control apparatus 1000.

10 The data transmission apparatus repeatedly multiplexes and transmits the data 8000 with a predetermined interval, with this transmission being the same as shown in Fig. 4 of the related art section, except that the image data and navigation information in Fig. 4 are replaced with those shown in Fig. 30. The multiplexing is also performed in the same manner as shown in Fig. 5 of the related art section.

Detailed Description of the Navigation Information

15 The following is a description of the navigation information shown in outline in Fig. 30, with reference to Fig. 31.

20 Fig. 31 shows the data construction of the navigation information 8160. This navigation information is composed of a Time_Event_Part 8161, a Bytecode_Part 8162, a Handler_Part 8163, a Graphics_Property_Part 8164, a
25 Bitmap_Information_Part 8165, and a
Hyperlink_Information_Part 8166.

The data construction of the navigation information 8160 is largely the same as the data construction of the navigation information 2160 in the first embodiment, although there are differences in the Time_Event_Part 8161.

5 The Time_Event_Part 8161 corresponds to the information shown as "Time_Event" in Fig. 30, and is used to record information for activating a specified handler when an indicated time has elapsed from the start of display of the content. In the example of Fig. 31, the handler with the handler number "2" is activated ten seconds from the start of display of the content. Here, it is possible for a plurality of elapsed times before activation to be recorded in the Time_Event_Part. These elapsed times are given in hour, minute, second, and frame format.

10
15
20 The Bytecode_Part 8162 is used to record the bytecodes. In the example of Fig. 31, the bytecode with the bytecode number "0" is "PushL0, GotoPage" expressing a switch of display to a content shown by link number "0", the bytecode with the bytecode number "1" is "PushL1, GotoPage" expressing a switch of display to a content shown by link number "1", and the bytecode with the bytecode number "2" is "PushL2, GotoPage" expressing a switch of display to a content shown by link number "2".

25 The Bitmap_Information_Part 8165 records the contents of the bitmaps used to display the buttons corresponding to different graphics numbers. In the example in Fig. 31, the

graphics number "0" corresponds to the bitmap for "Apple" and the graphics number "1" corresponds to the bitmap for "Tangerine".

5 The Graphics_Property_Part 8164 is information for composing the on-screen display graphics. In the example in Fig. 31, the graphics type is "Button", the graphics numbers "0" and "1" correspond to the numbers of the graphics included in the Bitmap_Information_Part, and the coordinates of button "0" and button "1" are given as (20,20) and (20,60). The handlers which are activated when button "0" and button "1" are selected are given as handler numbers "0" and "1", and the initial states of the buttons for the display of the contents are both given as "visible".

10 The Hyperlink_Information_Part 8166 records the IDs of the materials that compose the link destination contents, and has a collection of identifiers corresponding to each content that is identified as a link number. For the example in Fig. 31, "VE_id=1" is given as the link destination for link "0", and so shows that the content
15 composed of the image data with the VE_id "1" is a link destination. The link destination for the link number "1" is shown as the content composed of the image data with the VE_id=2, and the link destination for the link number "2" is shown as the content composed of the image data with the
20 VE_id=3.

25 It should be noted here that NE_id given as "0" at the

top of Fig. 31 shows that the navigation information being explained here is the navigation element which has the ID "0".

The navigation information with this "NE_id=0" forms a content together with the image data for displaying the question that has the VE_id "0".

Using the data described above, a new content will be displayed when a user makes a button operation in response to a content displayed by the data display control apparatus 1000. Also, when the time period given in the Time_Event_Part has elapsed from the start of display of a content, control is performed to execute the specified operation.

Operation of the Data Display Control Apparatus

The following is a description of the operation of the reception control unit 1050 of the data display control apparatus 1000 based on the data construction described above, with reference to the drawings.

Fig. 32 is a flowchart showing the content switching process and activation of a handler, while Figs. 33A and 33B show the transformation in the display screen when the user gives an answer within the set response time, and when the user does not give an answer within the set response time.

The processing of the reception control unit 1050 is composed of steps S8510 to S8620 in Fig. 32. Step S8510 is

an initial process for indicating the content to be displayed first when the reception of a program is commenced. When S8520 judges that content switching has been performed, steps S8530 to S8560 are performed. When
5 S8570 judges that there is a handler to be executed at an indicated time, the processes in S8580 and S8590 are performed. Steps S8600 and S8610 are performed in response to user inputs and step S8620 is performed to activate a handler.

10 The information specifying the first content is given as a pair of a VE_id and an NE_id in the PMT stored in the system information storage unit 1043. In the following explanation, an example where the information "VE_id=0" and "NE_id=0" is given in the PMT is used.

15 First, the reception control unit 1050 obtains the information "VE_id=0", "NE_id=0" from the PMT as the information for the content to be displayed first (S8510).

Since this is the first content, the system considers that content switching has been performed (S8520:Yes) and so
20 displays the present content (S8530).

The display of this first content is achieved by displaying the image data 8150 with the VE_id=0 as the background image and on-screen display graphics in accordance with the content of the navigation information
25 with the NE_id=0. Here, the button "Apple" is visibly displayed at a position given by the coordinates (20,20) and

the button "Tangerine" is visibly displayed at a position given by the coordinates (20,60), in accordance with the content of the Graphics_Property_Part 8164 and the Bitmap_Information_Part 8165 of the navigation information shown in Fig. 31. This results in the display shown as 8910 in Fig. 33A.

Once the present content has been displayed, the reception control unit 1050 judges whether there is a time period indication for the activation of a handler at a specified period after the start of display in the Time_Event_Part of the NE (S8540), in which case the time period indication flag for handler activation processing in response to time is set at "1" (S8550). When there is no time period indication, the time period indication flag is set at "0" (S8560). Here, since the handler with the handler number "2" in the Time_Event_Part of the navigation information shown in Fig. 31 is set as being activated at a point where ten seconds have elapsed from the start of display, the time period indication flag is set at "1" (S8550).

When the time period indication flag has been set at "1" (S8570:Yes), the reception control unit 1050 measures the elapsed time from the start of display of the content (S8580) and judges whether the elapsed time has reached the time period indicated for the activation of the handler in the Time_Event_Part 8161 of the NE (S8590). When the

indicated period has not elapsed, the reception control unit 1050 switches to the processing for the movement of the selection pointer in accordance with user operations (S8600). When one of the buttons has been selected and
5 activated (S8610), the reception control unit 1050 advances to the handler activation step (S8620).

The case where the user gives his/her response five seconds from the start of display of the question is described below.

10 Since ten seconds have not elapsed (S8580, S8590), the reception control unit 1050 proceeds to the processing for the movement of the selection pointer in accordance with user operations (S8600). When the user selects and
15 activates the button "Apple" five seconds from the start of the display of the content (S8610), the reception control unit 1050 refers to the Graphics_Property_Part 8164 and activates the handler with the handler number "0" (S8620). The handler with the handler number "0" is composed of the
20 bytecode "0" whose content is "PushL0, GotoPage", so that content switching is performed to the content with the VE=id "1" for the link number "0" given in the
Hyperlink_Information_Part 8166. This execution of
bytecodes is performed by the bytecode interpreter 1051 of the reception control unit 1050.

25 After activation of a handler (S8620), the reception control unit 1050 returns to S8520 to judge that content

switching has been performed and so display the new content (S8530). This results in the display screen for a correct answer being displayed, as shown by display 8920 in Fig. 33A.

5 The case where the user does not gives his/her response within ten seconds from the start of display of the question is described below. Note that the display at the start of this procedure is display 8930 of Fig. 33B.

10 Once ten seconds have elapsed from the start of display (S8580, S8590), the handler with the handler number "2" is activated (S8620). The handler with the handler number "2" is composed of the bytecode "2" whose content is "PushL2, GotoPage", so that content switching is performed to the content with the VE=id "3" for the link number "2" given in the Hyperlink_Information_Part 8166.

15 After activation of a handler (S8620), the reception control unit 1050 returns to S8520 to judge that content switching has been performed (S8520) and so display the new content (S8530). This results in the display screen for "time up" being displayed, as shown by display 8940 in Fig. 33B.

20 By operating in this way, the data display control apparatus 1000 can execute the processing of a specified handler after a predetermined time period has elapsed starting from the display of a content by the data display control apparatus 1000.

Seventh Embodiment

The following is an explanation of the seventh embodiment of the present invention, with reference to the drawings. The present embodiment relates to a data display control information editing apparatus which displays the interrelations of contents at a time indicated by the user.

Construction

The construction of the data display control information editing apparatus of the seventh embodiment is shown by the block diagram in Fig. 34.

The data display control information editing apparatus 10000 is composed of a time input receiving unit 10010, a data storage unit 10020, a content relation judging unit 10030, and a content relation display unit 10040.

The time input receiving unit 10010 receives a user input of a standard time for displaying the interrelations of contents. Here, a direct numerical input of time made by the user is stored in an internal register (not illustrated).

The data storage unit 10020 stores the navigation information. The data construction of this navigation information is the same as that described in the second embodiment (see Fig. 17).

The content relation judging unit 10030 refers to the Handler_Part, the Bytecode_Part, and the

Hyperlink_Information_Part of the navigation information stored in the data storage unit 10020, and, by investigating the contents of the bytecodes corresponding to the valid sub-handlers at the indicated time obtained by the time input receiving unit 10010, outputs the NE_id and VE_id of the contents that are link destinations for the sub-handlers that are valid at the indicated time to registers (not illustrated) provided in the data display control information editing apparatus.

The content relation display unit 10040 displays images representing the contents and lines representing the links between contents on a display screen.

Operation

The following is a description of a specific example of the operation of the data display control information editing apparatus 10000 based on the example sets of navigation information shown in Figs. 17 to 19. A flowchart for the operation of the data display control information editing apparatus 10000 is shown in Fig. 35.

The content relation display unit 10040 first refers to the Handler_Part, the Bytecode_Part, and the Hyperlink_Information_Part of the navigation information stored in the data storage unit 10020 and investigates the contents of the bytecodes corresponding to all of the sub-handlers. As a result, "GotoPage" is detected, and the

NE_id and VE_id of all of the link destination contents are obtained (S10110, S10120, S10130). The content relation display unit 10040 then displays the link relations of contents by displaying images for the contents and lines representing the links between the contents (S10140, S10150). Here, however, the lines between contents are drawn as broken lines showing that the links are invalid. Icons are used in the display as the images for representing contents and each record the VE_id and NE_id of the elements which compose the content represented by the icon.

Fig. 36 shows an example of a display screen displayed by the data display control information editing apparatus 10000.

After step S10150 has been completed, the display screen is as shown by display 10300 in Fig. 36.

The time input receiving unit 10010 next receives an user input of an indicated time (S10160), which in the present example is 14:59:00 on September 9, 1996.

The content relation judging unit 10030 first refers to the Handler_Part 2173 of the navigation information 2170 with the NE_id=0, and judges that the sub-handler "0" is valid at 14:59:00 on September 9, 1996 (S10170, S10180). The content relation judging unit 10030 then detects the bytecode "PushL0, GotoPage" corresponding to the sub-handler "0" that executes a link to the content with the link number "0", and so sets the link to the content given by the

NE_id=1, VE_id=1 for the link number "0" as valid, storing the values NE_id=1, VE_id=1 in an internal register (S10190).

Following this, the content relation judging unit 10030 focuses on the sub-handlers "1" and "2" of the navigation information 2170, before focusing on the sub-handler "0" of the navigation information 2270 and the sub-handler "0" of the navigation information 2370, and executing the same processing as described above (S10170, S10180, S10190, and S10200).

As a result, the content relation display unit 10040 draws solid lines showing the valid links between contents based on the information for links which are valid at the indicated time 14:59:00 on September 9, 1996 (S10210). This results in the display shown as display 10400 in Fig. 36.

As described above, the data display control information editing apparatus of the seventh embodiment is able to display the links between contents at a time indicated by the user in a way which allows the user to distinguish valid links from invalid links.

Eighth Embodiment

The following is a description of the eighth embodiment of the present invention, with reference to the drawings.

In addition to the functions of the seventh

embodiment, the data display control information editing apparatus of the eighth embodiment is able to update the information for controlling the display of data.

5 Construction

Fig. 37 is a block diagram showing the construction of the data display control information editing apparatus of the eighth embodiment of the present invention.

10 The data display control information editing apparatus 10500 is composed of a time input receiving unit 10010, a data storage unit 10020, a content relation judging unit 10030, a content relation display unit 10040, a non-link destination content selection receiving unit 10510 and a data updating unit 10520.

15 The time input receiving unit 10010, the data storage unit 10020, the content relation judging unit 10030, and the content relation display unit 10040 are the same as in the seventh embodiment, and so will not be explained further.

20 The non-link destination content selection receiving unit 10510 has the user select a content to which a link is to be prohibited, and outputs the VE_id and NE_id of the selected content to a register provided in the data display control information editing apparatus. This user selection of a content can be made, for example, by indicating one of
25 the icons representing contents on the content relation display unit 10040 using a selection pointer.

The data updating unit 10520 updates the content of the data storage unit 10020 by resetting the valid period information for the sub-handler corresponding to the bytecode which represents the link to the content selected by the non-link destination content selection receiving unit 10510, based on the indicated time received by the time input receiving unit 10010.

As a result, the data updating unit 10520 resets the navigation information so that a sub-handler representing a link to the selected content will be made invalid from the indicated time onwards.

Operation

The following is an explanation of the operation of the data display control information editing apparatus 10500 for the same specific data example as the seventh embodiment, with reference to Figs. 36, 38, and 39.

Fig. 38 is a flowchart showing the operation of the data display control information editing apparatus 10500 of the eighth embodiment.

The steps in the flowchart in Fig. 38 which are the same as steps in the flowchart for the data display control information editing apparatus 10000 of the seventh embodiment have been given the same reference numerals and will not be explained. The following explanation will instead focus on the processes in S10610 onwards, and

supposes that the display screen is as shown by display 10400 in Fig. 36.

When the user selects icon 10420 representing a content, the non-link destination content selection receiving unit 10510 receives this selection and stores the NE_id and VE_id of the selected content in a register in the data display control information editing apparatus (S10610). After a selection has been received by the non-link destination content selection receiving unit 10510, the data updating unit 10520 refers to the Handler_Part, the Bytecode_Part, and Hyperlink_Information_Part of the navigation information in the data storage unit 10020 based on the NE_id and VE_id in the register, and detects the sub-handler corresponding to the switching to the content selected by the user (S10620). The data updating unit 10520 then updates the ending time of the valid period of the detected sub-handler to the indicated time which was received by the time input receiving unit 10010 (S10630).

When the user has selected the content with the NE_id=1 and the VE_id=1, the data updating unit 10520 refers to the Hyperlink_Information_Part 2176 of the navigation information 2170, and judges that the link with the link number "0" needs to be invalidated. The data updating unit 10520 then refers to the Bytecode_Part 2172 and the Handler_Part 2173, detects the sub-handler "0" which corresponds to the bytecode "0" which describes the link to

the link number "0", and resets the valid period of sub-handler "0" so that it ends at 14:59:00 on September 9, 1996.

It should be noted that while the flowchart in Fig. 38 only shows the processing as far as the updating of the valid period of a sub-handler (S10630), it is also possible for the processing to return to S10170 or to S10160 after the completion of S10630, so as to repeat the processing. By doing so, the user is then able to select another content so that the navigation information can be updated to invalidate the link to this content from the indicated time onwards.

As described above, the data display control information editing apparatus of the eighth embodiment updates the navigation information based on the selection of a content by the user and an indication of time made by the user, so that the link to the selected content becomes invalid at the indicated time.

The above first to eighth embodiments have been used to describe the data display control apparatus and data display control information editing apparatus of the present invention, although it should be clear that the present invention is not limited to these embodiments. Possible modifications are described below.

(1) In the first to sixth embodiments, sets of

instructions are given as bytecodes, although a variety of instructions for a variety of processes may be used as the bytecodes. As one example, instructions related to hardware operations, such as powering down the system, may be used.

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(2) In the first to sixth embodiments, information relating to time is set in units of one set of information for each handler, sub-handler, or set of graphics, although the same time information may be collectively set for a plurality of handlers, sub-handlers, and sets of graphics.

(3) In the first to sixth embodiments, the contents were described as being composed of combinations of still images and on-screen display graphics, although contents may include video data and audio data. This video data and audio data may be multiplexed and transmitted by the data transmission apparatus according to MPEG2 system standard.

(4) In the first to sixth embodiments, the navigation information was described as including a Graphics_Property_Part for indicating graphics, although the navigation information may also include an Audio_Property_Part that describes audio used as background music. Based on the Audio_Property_Part, the data display control apparatus may add audio to the display of contents. In such a case, information for the time at which audio

reproduction is valid can be given as an element of the Audio_Property_Part, so that the control of audio reproduction can be achieved based on an indicated time.

5 (5) The first and third embodiments describe an example where a handler is activated once an indicated time is reached, although a handler written in a Time_Event_Part of the navigation information of a new content may also be executed when content switching is performed if the display
10 time written in the Time_Event_Part has already passed. Here, a plurality of pairings of times and handler numbers may be given in the Time_Event_Part. This may also be the same for the display of graphics in the fourth embodiment,
15 so that when the indicated time has passed, the graphics may be changed to the display state corresponding to the indicated time.

(6) The acquisition of the present time by the data display control apparatuses of the first to fifth
20 embodiments was described as the reception of transmitted data that expresses the present time, although each data display control apparatus may be provided with a timer mechanism from which the data display control apparatus can obtain the present time. It should be noted here that the
25 correction for a time difference in such case will be a correction of the difference between the standard time given

in the transmitted navigation information and the standard time of the present time obtained by the data display control apparatus from the timer mechanism.

5 (7) The control based on time in the second to fifth embodiments may be control according to an elapsed time based on a certain standard timing, in the same way as the sixth embodiment where control is performed according to elapsed time measured from the start of display of a content.

10 (8) The first to fifth, seventh, and eighth embodiments were described as handling expressions of time given in year, month, day, hour, minute, and second format, although they may instead handle expressions of time in year format, year and month format, year, month and day format, year, month day, and hour format, year, month, day, hour and minute format, or in a format that uses units that are smaller than one second.

20 (9) The first to sixth embodiments describe the case where a VE_id is given as an element in the Hyperlink_Information_Part, although a combination of a PID and a stream_id may be used instead of the VE_id. When
25 doing so, when content switching is indicated by a user operation, the data display control apparatus 1000 may set

the appropriate PID and other information in the filter condition storage unit 1021 and so have the image data separated from the transmitted transport stream.

5 (10) In the sixth embodiment, the measuring of the elapsed time was achieved by a timer provided in the data display control apparatus, although it is also possible for the data display control apparatus to keep time by receiving present time information in the same way as in the first to fifth
10 embodiments. When doing so, the data transmission apparatus will transmit present time information in the same way as in the first to fifth embodiments.

15 (11) In the first to eighth embodiments, the input method for receiving user operations may be achieved using a remote controller, a mouse, or any other kind of input device.

20 (12) In the seventh and eighth embodiments, the user input of the time indication is described as a direct input of time made using a keyboard, although an indirect input may be made by having the user select one of a plurality of potential values displayed on the display screen.

25 (13) In the seventh and eighth embodiments, the links between contents were described as being represented by broken lines and solid lines drawn between contents,

although other forms of representation may be used. As one example, links that are not valid at the indicated time may be drawn using transparent lines, which is to say the contents may be displayed as not being linked. Any kind of image may also be used as the icons for displaying the contents. The icons used for displaying link destination contents may also be displayed in a manner that distinguishes between link destinations which are valid at the indicated time and link destinations which are not valid.

(14) In the seventh and eighth embodiments, the interrelations between contents were displayed based on a detection of links performed by bytecodes that are "GotoPage", although it is also possible to display the interrelations of the display states of contents by detecting instructions that change display states, such as "SetGraphicVisibility" instructions.

(15) In the eighth embodiment, the valid period of a sub-handler that corresponds to a bytecode which achieves a link to the content indicated by the user is updated, although it is also possible for the time of the control for a change in the display state of graphics corresponding to the sub-handler to be changed, so that the display state becomes "invisible" at a certain time. Here, however, a data

storage unit 10020 for storing the navigation information with the data construction shown in the fourth embodiment becomes necessary.

5 (16) In the seventh and eighth embodiments, the data display control information editing apparatus displays the interrelations between contents at a time indicated by the user, with the navigation information showing the states of contents at the indicated time being the same as the
10 navigation information described in the first embodiment. However, this display of the interrelations between contents may be performed using the same navigation information as in any of the second to fifth embodiments.

15 (17) The processing of the reception control unit 1050 of the data display control apparatus in the first to sixth embodiments (shown in the flowcharts in Figs. 14, 20, 23, 25, 28, and 32) and the processing of the data display control information editing apparatuses 10000 and 10500 in
20 the seventh and eighth embodiments (shown in the flowcharts in Figs. 35 and 38) may be achieved by computer programs written in machine language, with recording media storing these programs being distributed and sold. These recording media can be IC cards, optical discs, floppy discs, ROMs, or
25 other media, with the machine language program recorded on the media being installed into standard hardware. This

standard hardware can be a conventional personal computer which executes the installed machine language program, thereby realizing the data display control apparatus of any of the first to sixth embodiments or the data display control information editing apparatus of the seventh or eighth embodiments.

Although the present invention has been fully described by way of examples with reference to accompanying drawings, it is to be noted that various changes and modifications will be apparent to those skilled in the art. Therefore, unless such changes and modifications depart from the scope of the present invention, they should be construed as being included therein.